

In describing the apparatus, Mr. Cavendish has not entered further than was necessary to explain the principle, and has left the completion of it to the skill of any artist who may choose to adopt it.

On a Method of examining the Divisions of astronomical Instruments.
By the Rev. William Lax, A.M. F.R.S. Lowndes's Professor of Astronomy in the University of Cambridge. In a Letter to the Rev. Dr. Maskelyne, F.R.S. Astronomer Royal. Read June 1, 1809. [*Phil. Trans.* 1809, p. 232.]

Since the utmost precision in making astronomical observations, and in reading off the indication given by any instrument, will be of no avail if the instrument itself be not divided with proportional accuracy, the author felt the importance of *estimating* the *probable* amount of errors that might occur in Bird's method of dividing by continual bisection, and has also contrived a method of examining the divisions of any circle, and of measuring, within certain limits, the actual errors in every part of it.

The apparatus by which this examination is effected, is first minutely described, and consists of a brass arc, rather more than 90° in length, placed concentric with the circle to be examined, and firmly attached to the frame which supports the microscopes. On this arc an upright pillar is made to slide, carrying a micrometer microscope, which may thus be fixed at any distance not exceeding 90° from one of the microscopes belonging to the circular instrument; and as the position of the microscope is inclined, it may be made to point to the same division upon the circle that is under the micrometer itself.

In the process of examination which follows, the position of the point of 180° having been first ascertained by means of the opposite micrometers belonging to the instrument, the arcs of 90° on each side are next examined by the moveable microscope, and the errors noted accordingly + or -. The microscope is then placed at the distance of 60° from the micrometer, and the first sextant is thus compared with every succeeding arc of 60° in the circle; and in the same manner, the first octant is compared with every succeeding arc of 45° , and the first arc of 30° with so many of the succeeding arcs of 30° as are necessary for determining each 15° of the whole circle.

The next intervals employed by Mr. Lax are those of 5° and 3° , from which, and from their multiples, the value of 1° , 2° , and 4° , are derived; and, in a similar manner, all the succeeding intervals down to the smallest interval to which the circle happens to be divided.

However, since the method of examination itself is liable to some error, the author computes the extent to which this may possibly amount; and upon a circle of one foot radius, he finds the greatest aggregate error to which he could be liable, in points most remotely deduced, might be $9''\cdot63$: but in a circle of three feet radius, the error would be reduced to $3''\cdot21$; and with glasses of higher magnifying power, and by frequent repetition of the reading off, the true

position of every point might be determined with sufficient exactness for every practical purpose.

The time required for such an examination is estimated to be about ninety-eight hours, and the labour, no doubt, is very considerable; but when the errors thus ascertained have been duly noted in a table, Mr. Lax considers the utmost pains that can be bestowed upon any instrument to be amply compensated by the confidence given to every subsequent observation by means of it.

It is also proposed occasionally to obviate the effects of unequal expansion in any particular observation, by comparing the arc by which any angle has been measured with several succeeding equal arcs, until the multiple exceeds the whole circumference, and thereby includes the opposite errors, which arise from this cause in different parts of a circle, and correct each other.

On the Identity of Columbium and Tantalum. By William Hyde Wollaston, *M.D. Sec. R.S.* Read June 8, 1809. [*Phil. Trans.* 1809, p. 246.]

The author having received specimens of the Swedish mineral tantalite, containing the metal called Tantalum, by Mr. Ekeberg, was desirous of ascertaining whether that metal might not be the same as columbium, which had been discovered a short time before by Mr. Hatchett; and for that purpose he procured some oxide of columbium from Mr. Hatchett, and also a fragment of the mineral in the British Museum, originally analysed by Mr. Hatchett.

He describes the external resemblance to be such, that one might be taken for the other; but observes, that the columbite is rather more brittle than tantalite.

By analysis, also, he finds them to consist of the same three ingredients; namely, a white oxide, iron, and manganese.

To separate these substances, the mineral is powdered and fused with carbonate of potash and a small proportion of borax. The iron and manganese may then be dissolved, along with the salts employed, by muriatic acid, and the oxide of columbium or tantalum remains as a white powder for further trial of its properties.

Five grains of columbite being thus treated, left four grains of white oxide; and the solution yielded three fourths of a grain of iron, and one fourth of a grain of manganese.

Five grains of tantalite, by the same treatment, left four grains and a quarter of oxide, half a grain of iron, and two tenths of a grain of manganese.

The white oxides obtained from each of these minerals appear to the author to have precisely the same properties.

They are each soluble by means of about eight parts of potash.

They are both very imperfectly soluble by means of soda.

They are both insoluble in nitric, muriatic, succinic, and acetic acids.

They are both very sparingly soluble in strong sulphuric acid